WORLD TRADE CENTER

STRUCTURAL INTEGRITY INSPECTION

Accessible Columns at

1,2,4 and 5 WTC

29 January 1993

211 East 46th Street
New York, NY 10017-2989
Tel: (212) 750-9000
Fax: (212) 750-9002

PLAINTIFF'S EXHIBIT
PX-733

LERA

EXECUTIVE SUMMARY

This report details the findings of the inspection of accessible columns in the elevator shafts of 1, 2 and 5 World Trade Center.

No structural deficiencies such as cracking or bowing were found in any of the columns inspected.

The most common irregularities observed were missing fireproofing and light surface rusting of exposed steel.

We recommend that fireproofing be repaired on all columns in the elevator shaft

LERA

WORLD TRADE CENTER
STRUCTURAL INTEGRITY INSPECTION
Accessible Columns at
1, 2, 4 and 5 WTC

CONTENTS

Executive Summary 1

Contents 2

Introduction 3

Procedure and List of Inspected Columns 5

Observation 7

Recommendations & Conclusions 8

Bibliography 9

Appendix A: Architectural Plans A-1

Appendix B: Figures & Photographs B-1

LERA

INTRODUCTION

Accessible columns are those columns which are not enclosed in any kind of architectural finish and can be seen easily for visual inspection.

This report is the first in a continuing program which will appraise the condition of all the accessible columns in the World Trade Center complex.

The columns are visually inspected for signs of:

- rusting;
- cracking;
- bowing or deviation from plumb;
- loss of fireproofing; and
- water damage.

The original architectural drawings were researched and accessible columns situated within elevator shafts were selected for this inspection. Particular shafts were chosen on the basis of:

- quantity of inspectable columns within the shaft;
- types of inspectable columns within the shaft; and
- convenience to the PANYNJ.

Refer to World Trade Center 1 & 2 Structural Integrity Inspection Report No. 1 dated 3 Novemeber 1992 for the assement of damage to:

- mechanical room column Base Enclosures; and
- interior column finishes of the perimeter columns at accessible tenant floors.

Refer to World Trade Center 4, 5, 6 & Vista Hotel and Subgrade Structural Integrity Report No. 1 dated 20 January 1993 for assement of damage to mechanical room column Enclosures.

The inspections were performed in January of 1993 by Mr. Rohan M. Parikh. Access to the inspected areas was provided by Mr. Francis Riccardelli and Mr. Robert Lynch of the Port Authority of New York & New Jersey.

LERA

The opinions expressed in this report represent our professioanl view based on the information made available to us. In developing these opinions, we have exercised a degree of care and skill commensurate with that exercised by reputable structural engineers of this location. No other warranty, expressed or implied, is made as to the professional advice included in this report.

PROCEDURE & LIST OF INSPECTED COLUMNS

The visual assessment of the accessible columns in the elevator shafts was carried out from top of the elevator cars. The elevator was operated by a field inspector from National Elevators.

The operator ran the elevator at a very slow speed from top to bottom and if any irregularity was noticed the car was stopped and the defect was duly noted and, at times, recorded using a 35mm camera.

A total of 10 elevator shafts were selected. This selection included 8 local elevators and 2 express elevators. Table A gives a listing of all the elevators and columns inspected during this survey.

LERA

TABLE A

Tower	Elevator Shaft Number	Floors Inspected	Adjacent Column Number	Face of Column Inspected
A (1 WTC)	21	4-78	606	East
		4-78	607	West
	36	1-32	701	East, South
		1-32	801	East, North
	63	45-67	701	East, South
		45-67	801	East, North
	73	43-74	703	North, West
		43-74	803	North, West
	83	78-93	701	East, South
		78-93	801	East, North
B (2 WTC)	15	4-78	602	North
		4-78	603	South, West
	29	1-16	707	South, East
		1-16	806	South, West
	56	45-54	707	South, East
		45-54	806	South, West
	78	78-86	707	South, East
		78-86	806	South, West
Northeast Plaza (5 WTC)	E-7 28	1-9	E-7 28	W

See Appendix A for the plan locations of the above columns.

LERA

OBSERVATION

Appendix B-2 shows the typical cross sections of columns used in elevator shafts. These columns are encased with sprayed on fireproofing. (Photo 1)

The most common irregularity in the express elevator shafts was spalling & missing fireproofing. The probable cause of this spalling may be attribute to:

- rubbing of the hoist cables against the face of column.
- air pressuresinduced due to high speed of the elevators moving up and down the shafts

Photograph 2 shows a patch of missing fireproofing at support brackets for conduits and elevator hardware. It appears that the fireproofing was removed when this bracket was installed.

Photograph 3,4 & 5 show typical patches of spalled fireproofing caused probably by rubbing of hoist cables against the girder and column faces.

Large areas of fireproofing were missing from the faces of column 606 and 607 in one World Trade Center.

The columns in local elevator shafts were generally well protected by fireproofing.

Isolated areas of spalling fireproofing were noticed on some of the columns in the local elevator shafts. (Photo 7,8,9)

Photograph 10 shows large areas of damaged and spalling fireproofing on column E-7/28 in the North East plaza building.

Light surface rusting was typically noticed in areas of exposed steel.

LERA

RECOMMENDATIONS & SUMMARY

No structural deficiencies were found in any of the columns.

We recommend that fireproofing be repaired on all columns in the elevator shafts.

While inspecting the slurry walls at B6 level LERA's inspector noticed deterioration of the column base enclosures, caused by ponding of water in that area. Although we have not inspected any of these columns, we recommend that an inspection of the column base enclosures of all columns at B6 level be undertaken on a priority basis.

LERA

BIBLIOGRAPHY

1) World Trade Center 1 & 2 Structural Integrity Inspection Report No. 1 dated 3 November 1992

2) World Trade Center 4,5,6 & Vista Hotel on Subgrade Structural Itegrity Report No. 1 dated 20 January 1993.

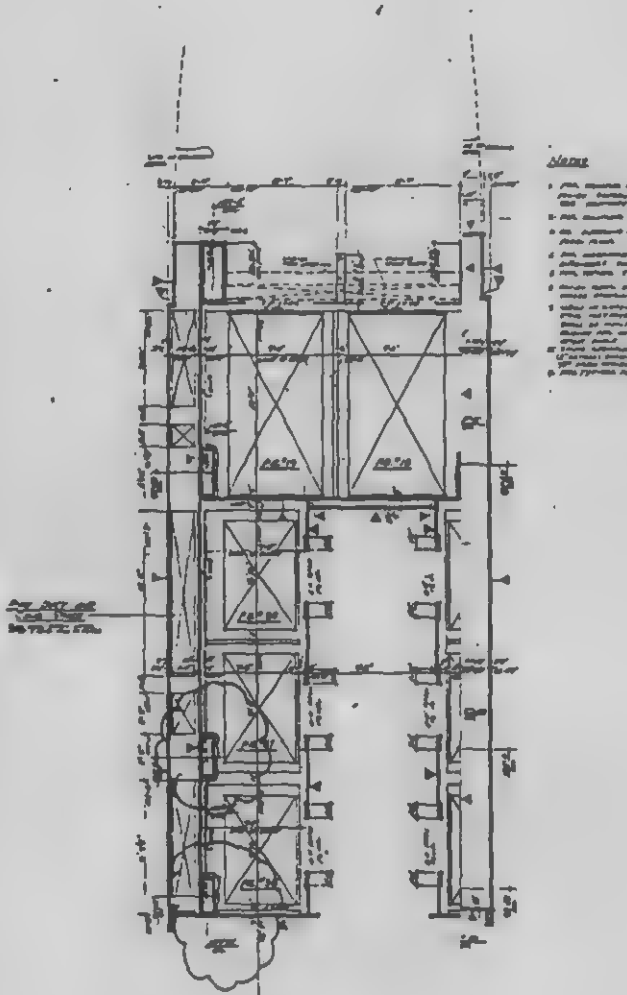
LERA

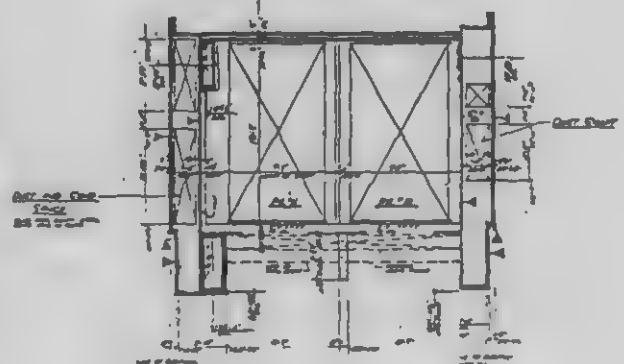
APPENDIX A - ARCHITECTURAL PLANS

List of ARCHITECTURAL PLANS

1. 1 WTC 1st FL CORE PLAN
2. 1 WTC 44th FL CORE PLAN
3. 1 WTC 78th FL CORE PLAN
4. 2 WTC 1st FL CORE PLAN
5. 2 WTC 44th FL CORE PLAN
6. 2 WTC 78th FL CORE PLAN
7. 5 WTC 1st FL CORE PLAN

A-2





RECEIVED

MAR 28 1973

SKILLING · HELLE
CHRISTIANSEN · ROBERTSON
230 PARK AVE. N.Y.C.

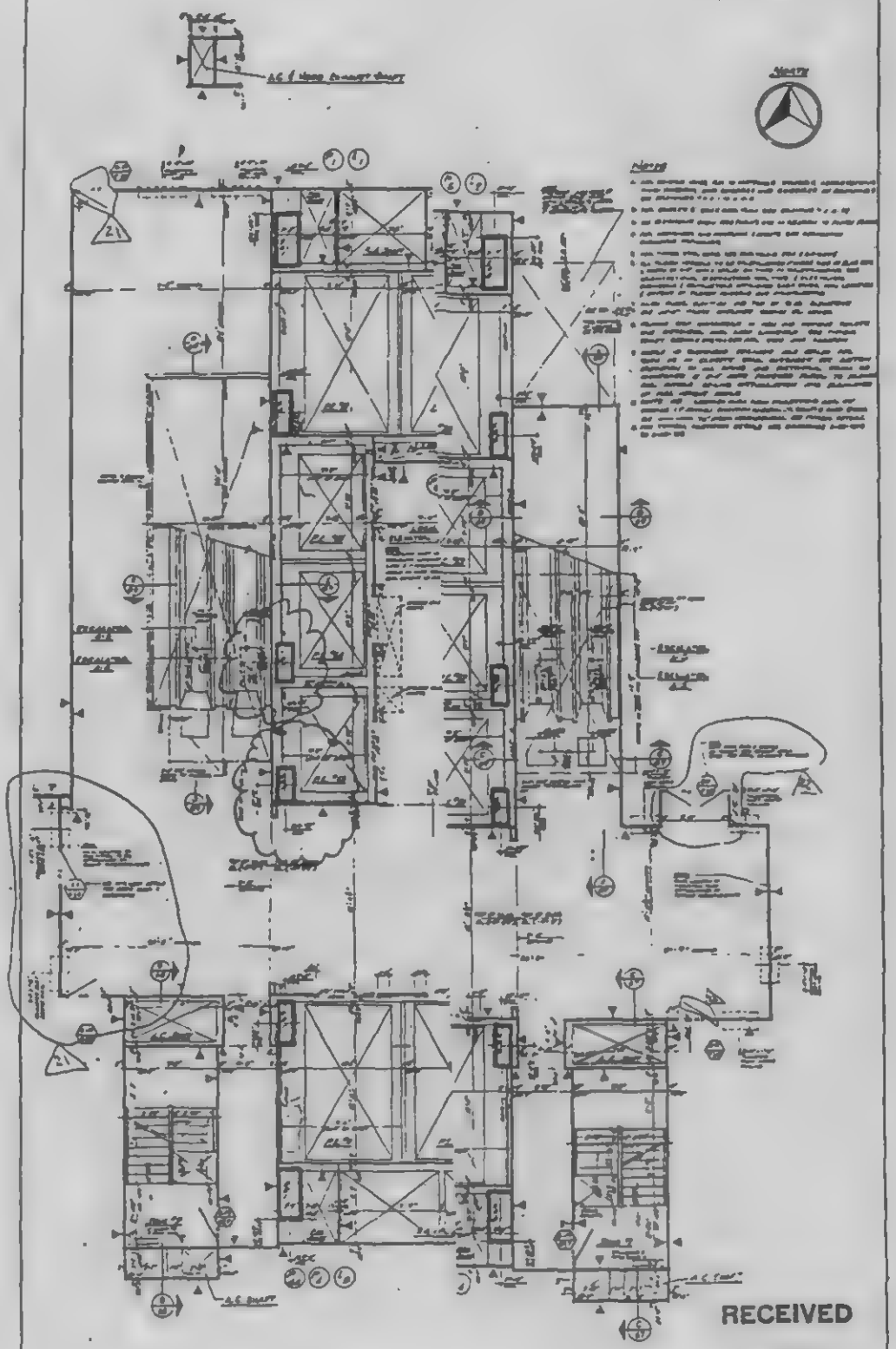
RLD TRADE CENTER

OF NEW YORK AUTHORITY

1st Floor Col. Plan

A·A·20

A-3



RECEIVED

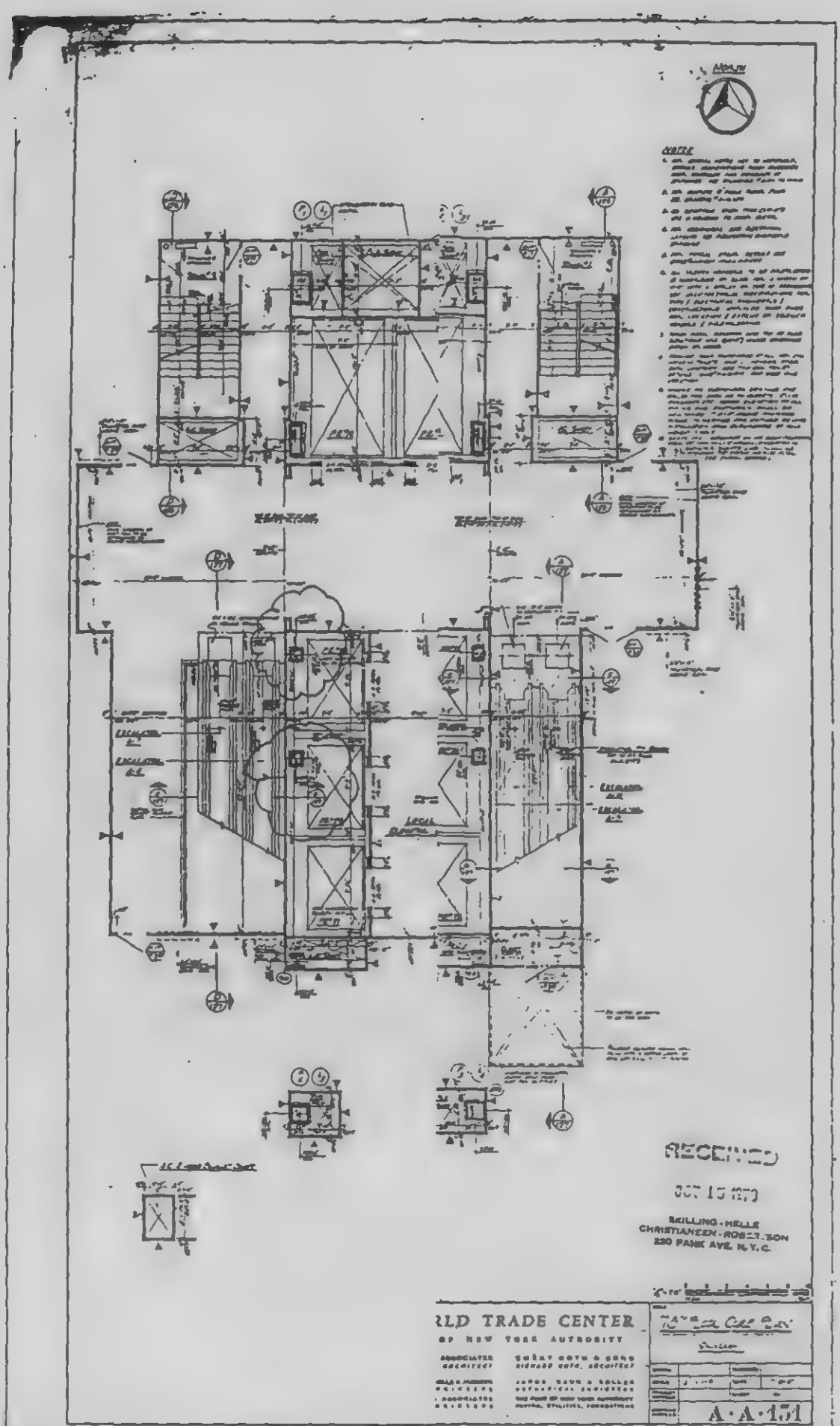
MAR 14 1972

SKILLING · HELLE
CHRISTIANSEN · ROBERTSON

LD TRADE CENTER

A·A·7.5

A-4



RECEIVED

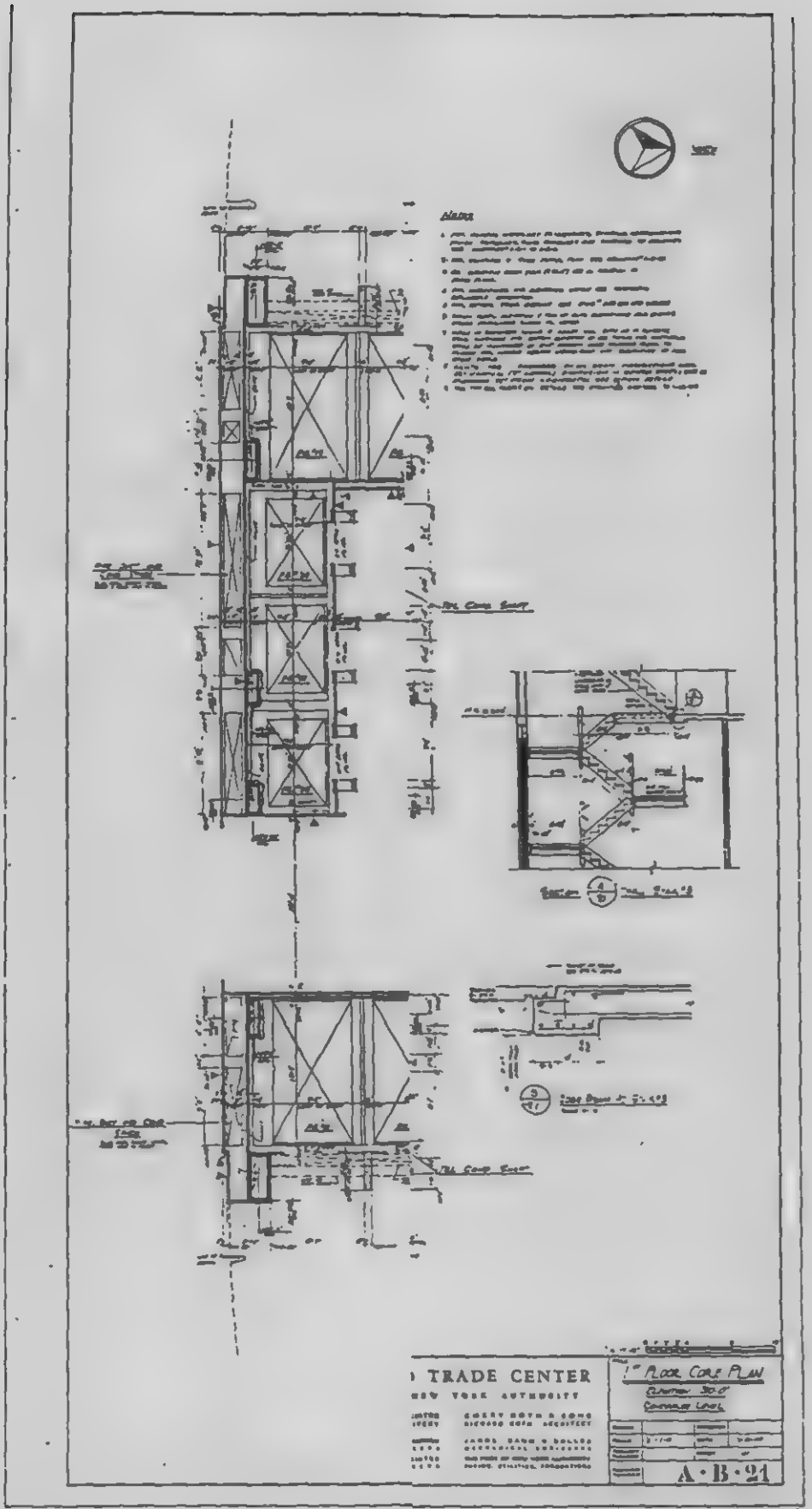
OCT 15 1971

SKILLING-HELLE CHRISTIANSEN-ROBERTSON
230 PARK AVE. N.Y.C.

RLD TRADE CENTER
OF NEW YORK AUTHORITY

A-A-151

A-5



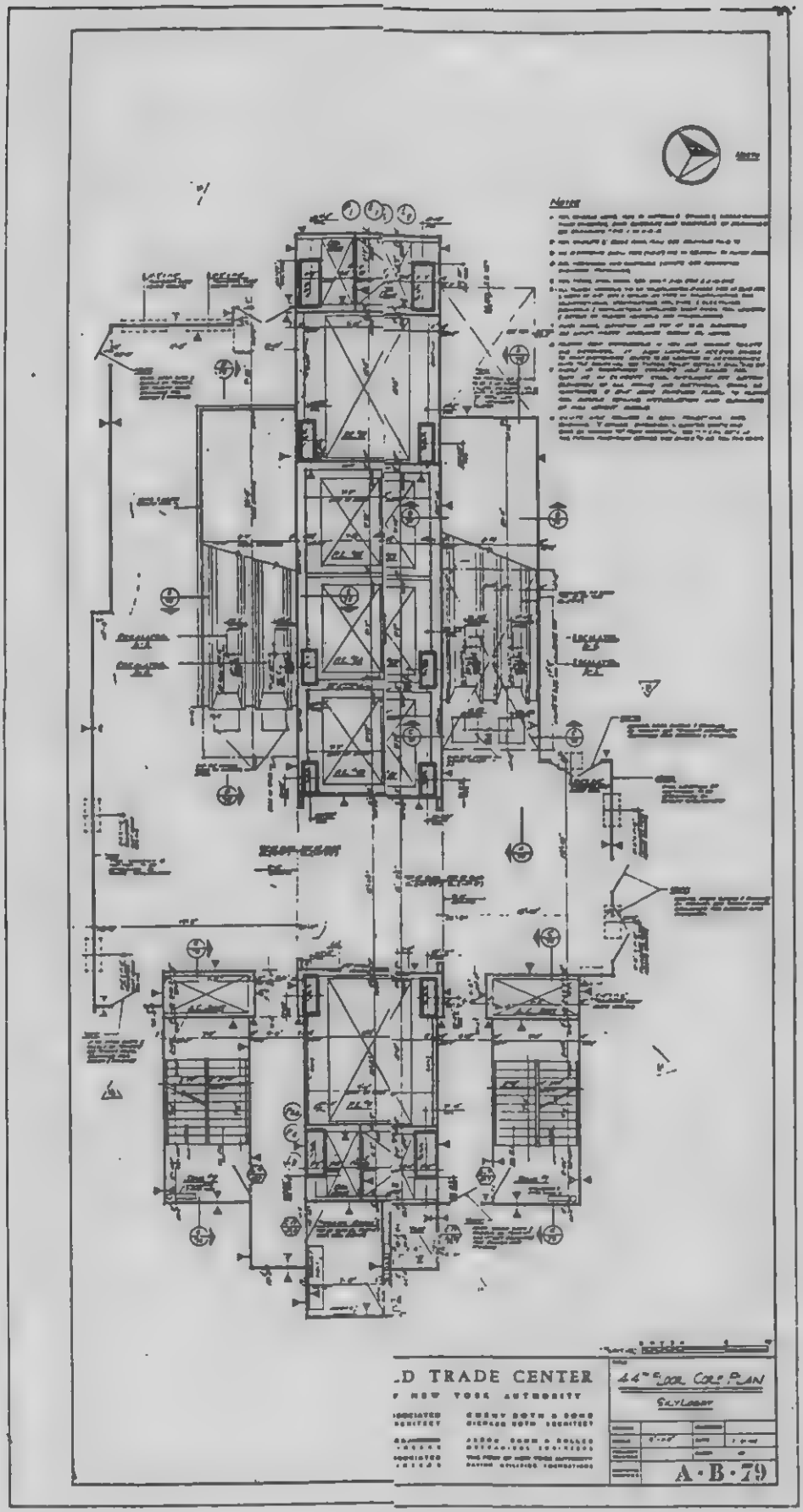
TRADE CENTER

NEW YORK AUTHORITY

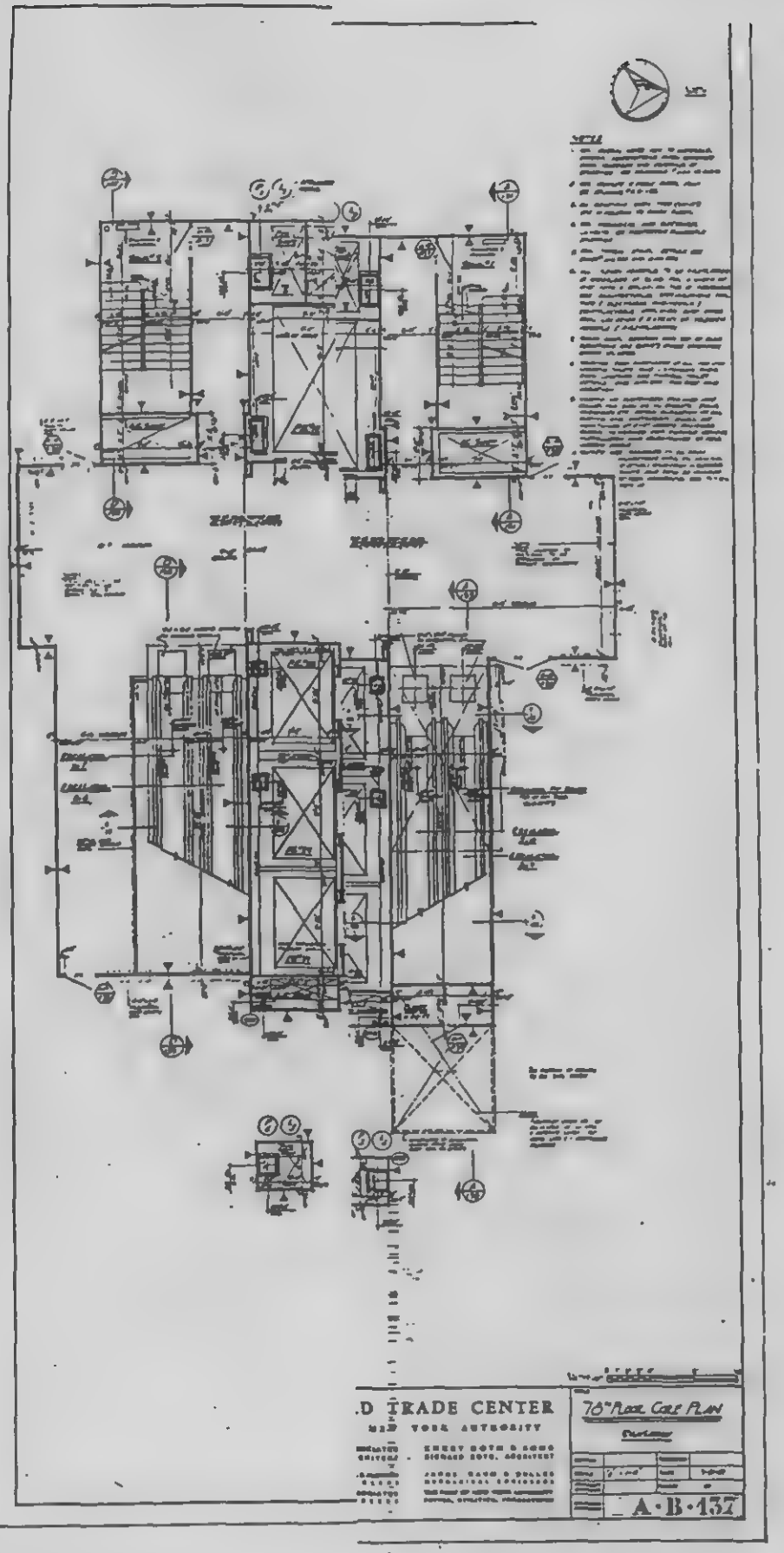
1st FLOOR CORE PLAN

A·B·21

A-6


D TRADE CENTER
NEW YORK AUTHORITY
44TH FLOOR CORE PLAN
SKYLOBBY
A·B·79

A-7

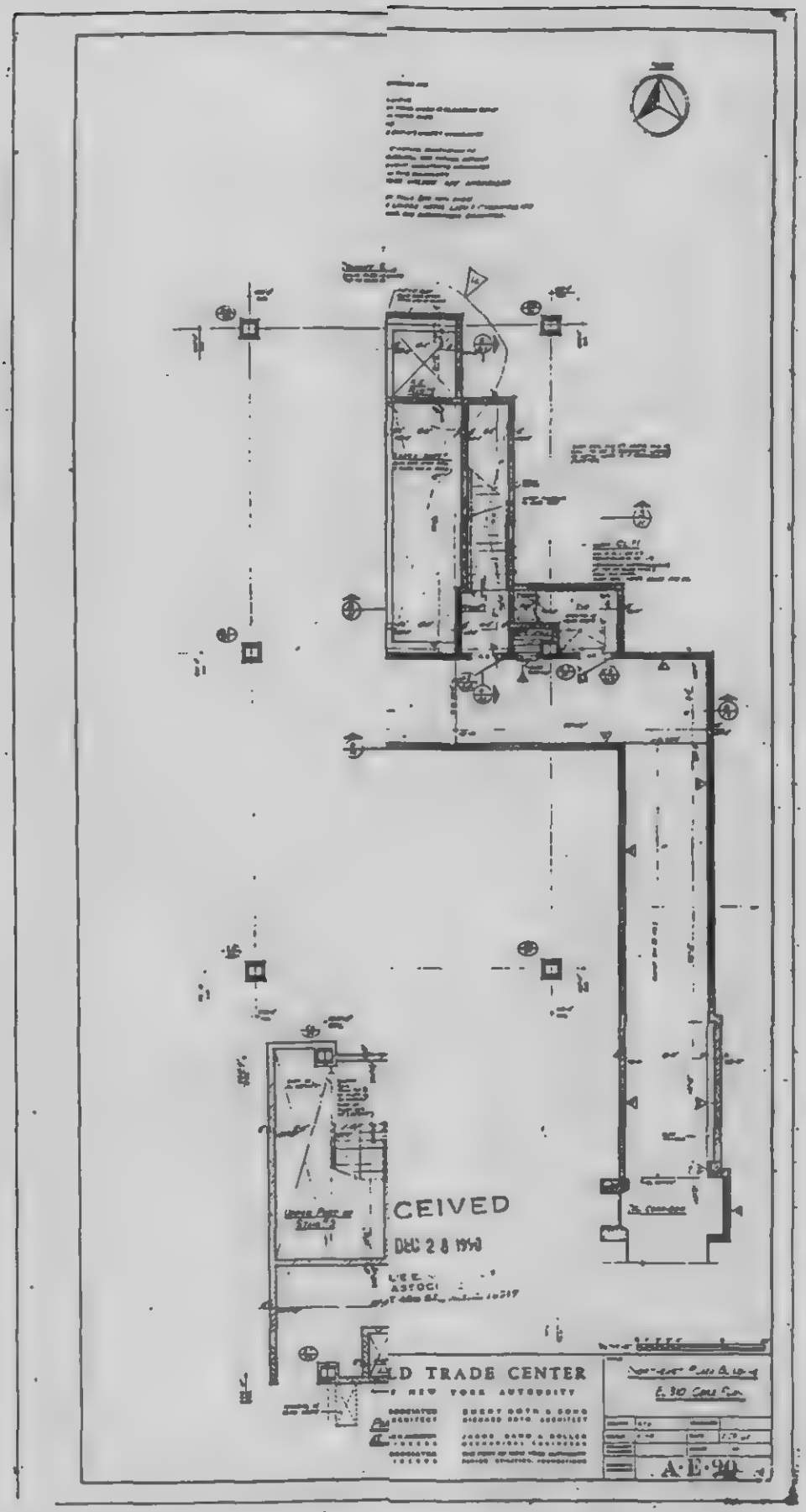


.D TRADE CENTER

76TH FLOOR CORE PLAN

A-B-137

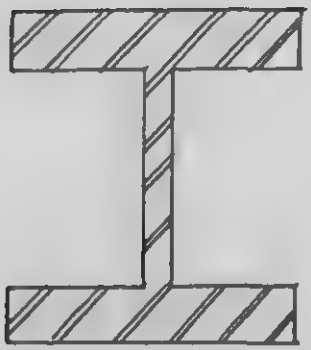
A-8



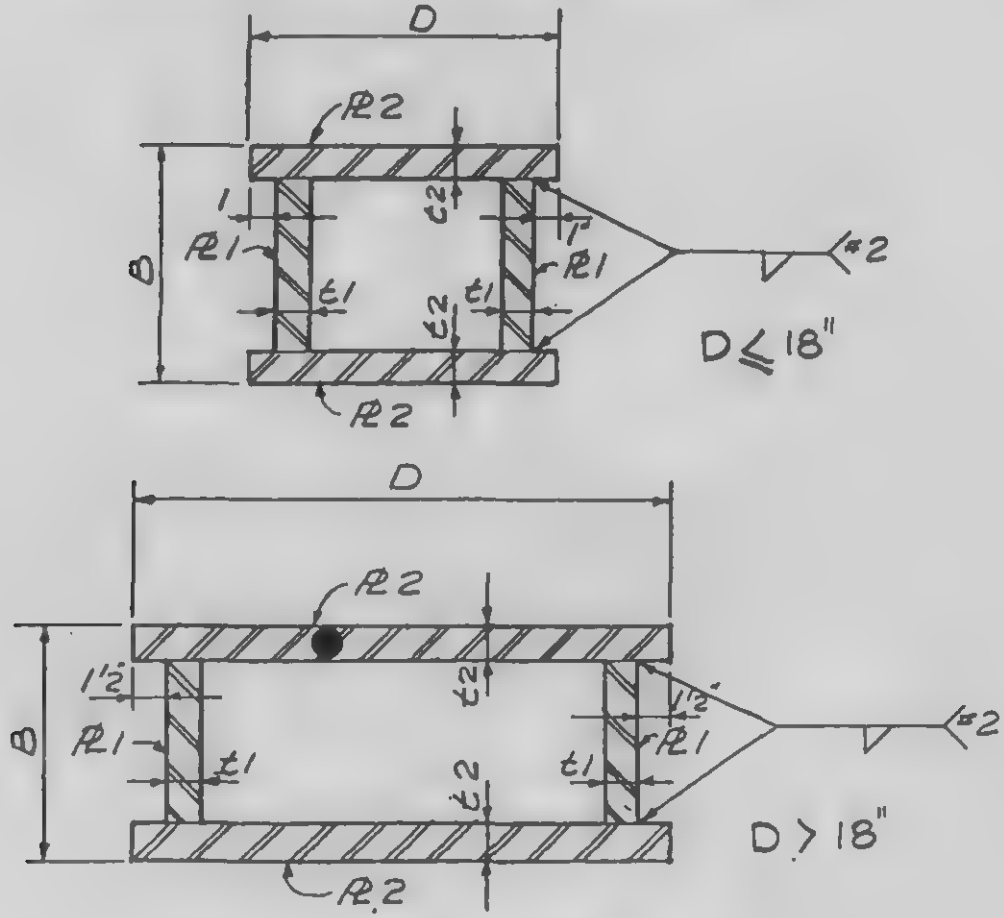
LERA

APPENDIX B

LERA



TYPICAL WIDE FLANGE COLUMN



TYPICAL BOX COLUMN

LERA

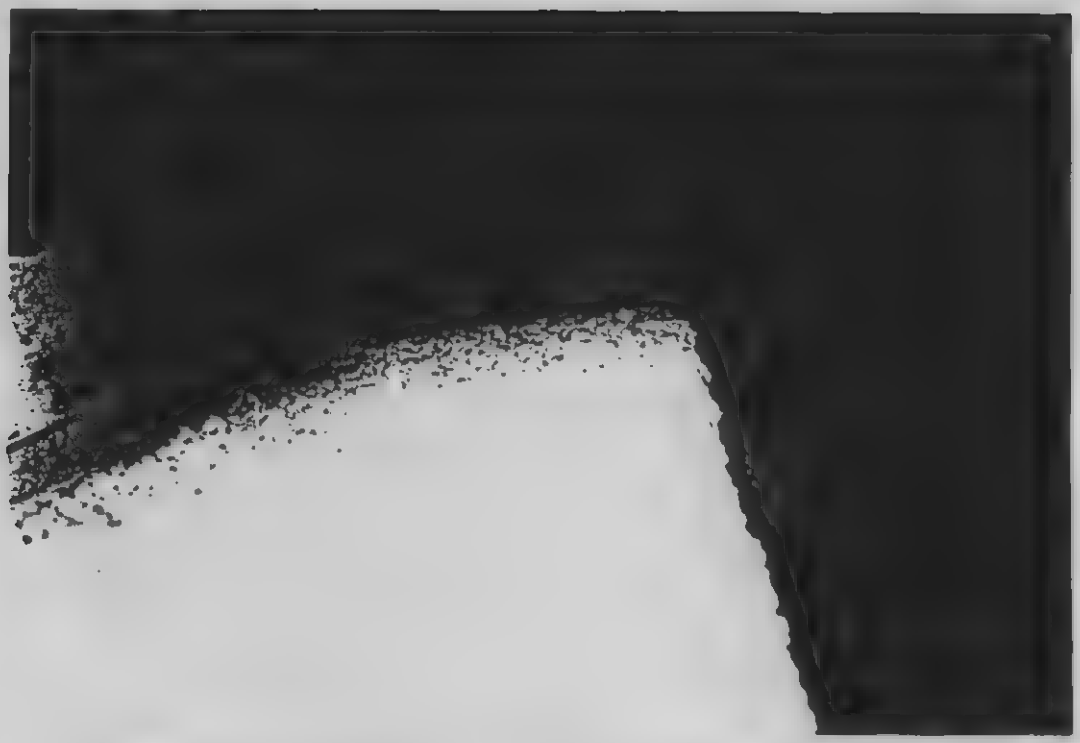


Photo 1: Looking at a typical column protected with fireproofing

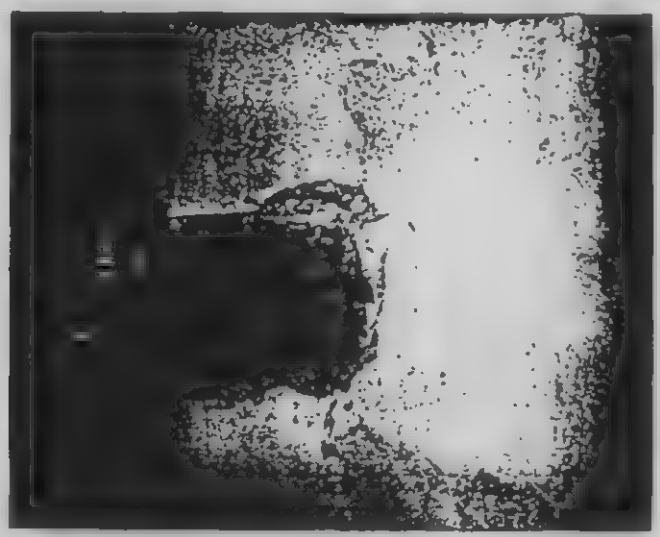


Photo 2: Small area of spalling fireproofing caused by mounting of bracket, supporting elevator hardware.

3) Photo 3:

4) Photo 4:

The above photos show patches of exposed steel caused by the rubbing of hoist cables against the shaft girders.

Photo 5: Vertical scar in fireproofing caused by slapping of the counterweight governor cable against the column face.

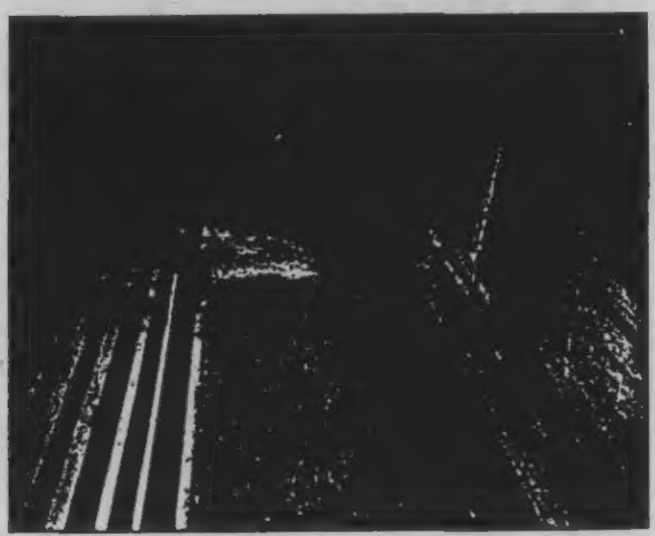


Photo 6: Large areas of fireproofing, missing from the east face of column 606 in Tower A.

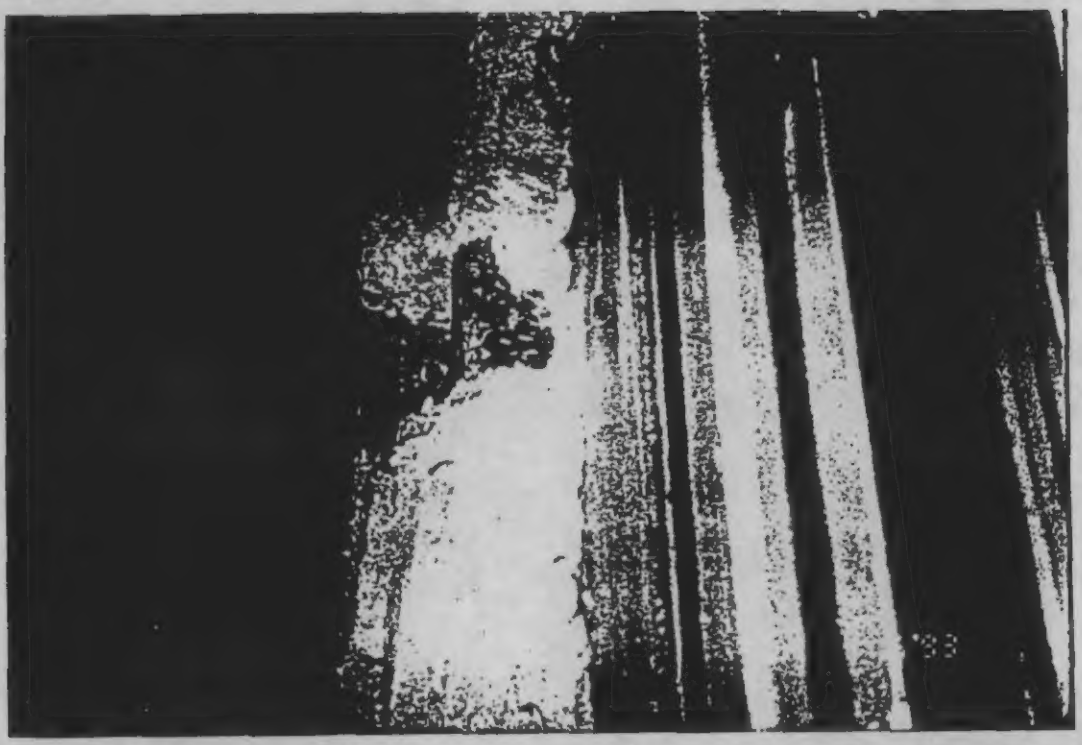


Photo 7: Isolated area of missing fireproofing at column splice location of column 701 in Tower A.

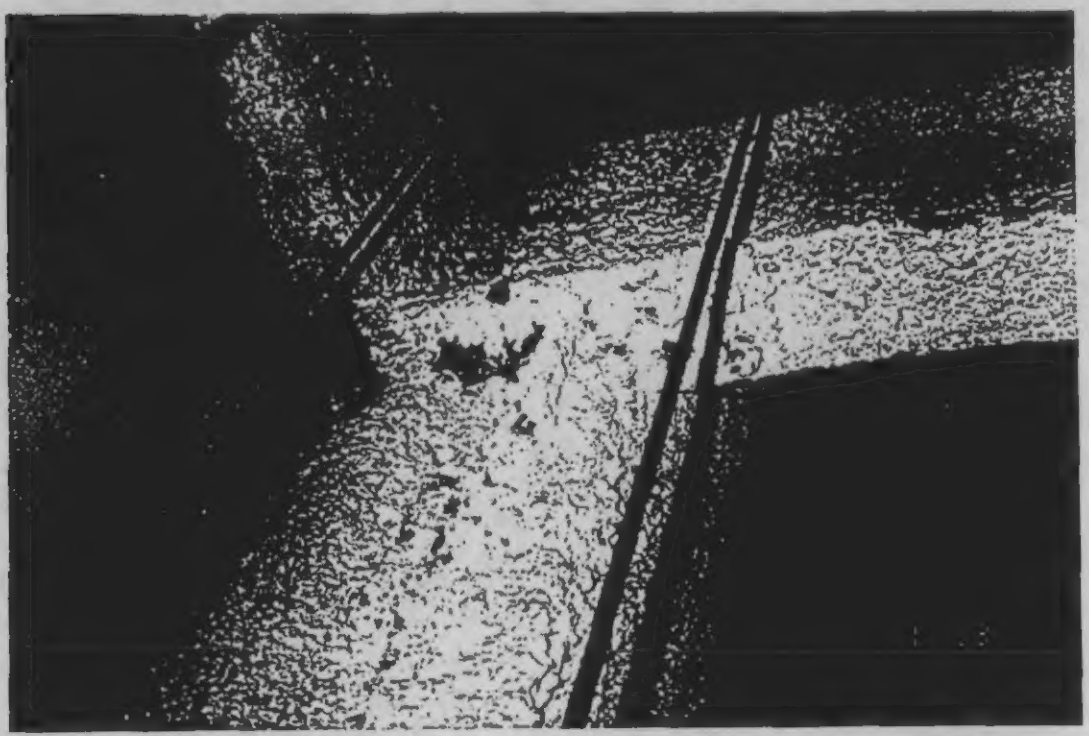


Photo 8: Exposed steel at beam to column connection shows light surface rust.

Photo 9: Isolated area of spalling fireproofing on Column 701 in Tower A.

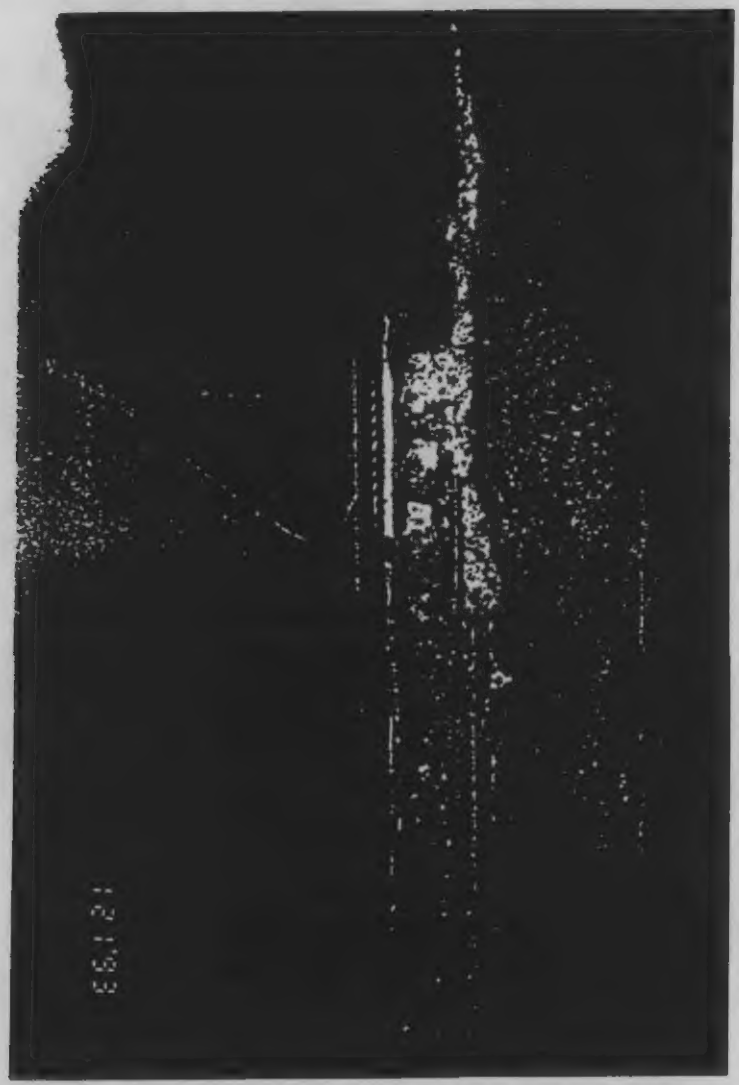


Photo 10: Fireproofing is missing from the flange and damaged at the web of col E-7/28 in the North East Plaza Building.